

READ AND DISCOVER:

- How children learn to make the best possible use of their senses, and navigate the world in a safe and successful manner
- How developing new eye tests helps us understand visual development during childhood and how these new tests help improve diagnoses by eye doctors
- How experience with various environments shapes how children process visual information
- Learn about Electroencephalography and functional Magnetic Resonance Imaging

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Summer Issue

JULY — SEPTEMBER 2017

A big thank you to all the parents who participated in our many studies! You have helped us discover many new things about visual development, which we have been published scientific journals, and presented at international conferences.

Our Team Presented 'Alien Fish Game' Results At Vision Sciences and Traffic Safety conferences all around the world!

Whether playing sports, reaching around obstacles, or navigating traffic on a foggy day, children constantly make difficult decisions in every day life. We want to find out how children use information in the world around them to make the best decisions they can - and if they aren't making the best decisions, why that is.

In one of our recent studies, we developed a fun touchscreen computer game called 'Alien Fish' to investigate how children acting under time constraints divide their time

between gathering information about when and how to move, and executing their movements carefully and precisely.



The aim of the Alien Fish Game is to find the hidden fish.

We found that, compared to adults, children tend to prioritise moving over looking - they're leaping almost before they look.

Rather than gathering enough visual information to make the best possible movement, children tended to move too soon. The younger a child was, the more this proved to be the case.

This kind of 'risky' behaviour may contribute to young children's higher accident rates for daily activities (such as crossing roads or playing sports) - so we hope that our research will help fuel initiatives better suited to helping children make better decisions.

Imogen, Grace, & Tessa

Achievements & Recent Publications:

- Welcome to Mahtab, our new PhD-student, and Hugo, our new Research Assistant!
- Congratulations to:
 - Peter for securing a grant from Moorfields Eye Charity to develop interactive 3D simulations of visual impairment, using virtual reality.
- Recently published papers:
 - Jones, P.R. & Dekker, T. (2017). The development of perceptual averaging: Learning what to do, not just how to do it. *Developmental Science*, e12584.
 - Dekker, T. M., & Nardini, M. (2016). Risky visuomotor choices during rapid reaching in childhood. *Developmental Science*, 19 (3), 427-439.
 - Jones, P.R., Yasoubi, N., Nardini, M., & Rubin, G.S. (2016). Feasibility of Macular Integrity Assessment (MAIA™) microperimetry in children: Sensitivity, reliability, and fixation stability in healthy observers. *Investigative Ophthalmology and Vision Science*, 57(14):6349-6359.

Who We Are

C H I L D
V I S I O N
L A B

UCL Child Vision Lab

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Our Mission Statement

Our goal is to understand how the ability to see develops in infants and children, and how different eye diseases can cause this process to go wrong.

The UCL Child Vision Lab was established in 2010 and is part of UCL's Institute of Ophthalmology. In collaboration with Moorfields Eye Hospital, we are committed to better understand typical and atypical visual development in childhood and infancy.

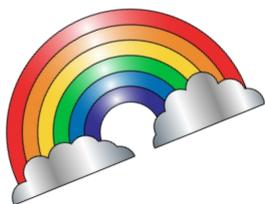
Using computer games and neuroimaging techniques, our team aims to explore how children and infants learn to see and act on the world, and what happens in the brain as their sensory and motor skills develop.

As well as providing interesting scientific discoveries, our work is important for the development of clinical treatments at Moorfields Eye Hospital, which will hopefully improve the lives of children (and adults) suffering from eye disease.

Thank You For Being Part Of Our Research!

We would like to say thank you to all the people who have been involved and helped us with our research, we couldn't do it without you!

We are still looking for participants or schools who want to take part in our research, so get in touch! Check out our website or our social media webpages, or drop us a call or email!





Science fun for kids!

Help UCL scientists discover how your brain develops!

The UCL Child Vision Lab is looking for **4 to 14 year-olds** who want to take part in one of our fun, child-friendly studies after school, at weekends, or during the holidays.

Register in our database at: tinyurl.com/yat2hq2p

For more information, call us on 0207 608 6819
or e-mail iou-cvl@ucl.ac.uk



JAMES S.
MCDONNELL
FOUNDATION



Moorfields Eye Hospital 
NHS Foundation Trust




National Institute for
Health Research



E · S · R · C
ECONOMIC
& SOCIAL
RESEARCH
COUNCIL

Fun Holiday And After School Activities At The CVL In The Coming Year!

- **Water Balloon Pop! — A Virtual Reality game**

Explore a virtual world and pop some water balloons with a cool hand-held laser!

Ages we are looking for: 6 to 14 year olds

- **Zebra Seeker — A computer game**

Find the hidden zebra and win tokens!

Ages we are looking for: 4 to 10 year olds

- **Intergalactic Party — An EEG study**

Help a lost alien to find his way to the galactic party!

Ages we are looking for: 6 to 8 and 10 to 12 year olds

To sign up for these studies, please drop us an email at:

i00-cvl@ucl.ac.uk

Water Balloon Pop!

In the 'Water Balloon Pop!' virtual reality study, we are examining how children explore the world using multiple forms of sensory information – in this case, their visual and motor (movement) systems.

Children use a virtual reality laser to pop water balloons as they fall out of the sky. Where children

stand affects how easy it is to see the balloons, and how easy it is to move and pop them. We want to see whether children will stand in the best place to gather the highest quality visual information, without making it too hard to reach out and pop the balloons.

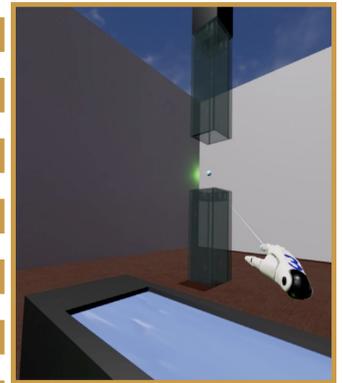
We can change how likely it is that the water balloons will fall from a particular

location, and see if children are able to adjust their position to account for these differences and get the highest score!

Adults are very good at making these kinds of multisensory decisions – so we'd like to know what happens as children develop.



Imogen



Example of the 'Water Balloon Pop!' virtual world.



Come play 'Hide and Seek' with the animal of the jungle!

Zebra Seeker

In our new 'Zebra Seeker' study, we are studying children's visual sensitivity abilities. This will help us understand how children complete crucial vision tasks such as finding things in low light, or noticing cars on a foggy road.

We ask children to play a computer game that involves detecting patches of black and white stripes on a TV screen. The aim is to develop a new kind of eye test, similar to the 'letter charts' you see in opticians.

This will help doctors at Moorfield's Eye Hospital (NHS), by providing a better way to detect eye disease in children, and help us discover how children's visual sensitivity develop as they grow up.



Mahtab

Let's Plan An Inter-Galactic Party!

In the 'Intergalactic Party' study, we are investigating how experience with natural and urban environments shapes how children process visual information.

Children are asked to play a computer game in

which they help a friendly alien organise a party. They can do this by telling the alien if the images that flash by his spaceship come from a natural or a man-made environment.

By recording brain waves with a special hat using a

method called EEG (*see next page for more info*) we can measure how children learn to interpret visual information very rapidly and efficiently, just like adults.



Nicolò & Hugo



Natural (top) versus man-made (bottom) environment

Coming Up In 2018: Secret Space Mission!

We are working on an exciting new study in which we will take pictures of children's brains while they are playing a game and watching some cartoons in an MRI scanner.

The game is a "spaceship detection game" in which children are asked to look at a colourful "radar" that scans space for lost ships. The brain activity that we measure while children play this game will help us understand how different

light-detector cells in the back of children's eye send visual information to the brain.

We will do this study with children with typical vision, but also with children who have an eye disease called achromatopsia, in which the light-detector cells in the back of their eye aren't working. This causes children to be colour blind and so sensitive to light that they often have to wear sunglasses. Doctor's at

Moorfields Eye hospital have developed a new treatment for these children that may help these cells work again, and our study is aimed at discovering how well this treatment works.

Over the next year we will be looking for child volunteers who want help with this important work, by playing games in the MRI scanner, get their very own brain picture taken!



Mahtab & Tessa



Get on board with the UCL Child Vision Lab crew!

What Is Functional Magnetic Resonance Imaging (fMRI)?



The acronym fMRI stands for functional magnetic resonance imaging; it is a safe procedure that uses a strong magnet to measure tiny changes in blood flow in the brain.

The MRI scanner looks like a big doughnut! Inside the doughnut is a comfortable bed and a TV screen, on which we can show fun cartoons and a



Homer Simpson's brain.

scanner and watch the TV screen whilst the scanner takes pictures of your brain!

Aisha



MRI scanner

series of small computer games.

You lie on the comfortable bed inside the

What Is Electroencephalography (EEG)?



Our brain cells communicate with each other using faint electric signals. We can eavesdrop on this communication by placing an array of sensors (a "net") on the head that can pick up the natural activity of the brain. This method is called electroencephalography or EEG.

Like MRI, EEG is completely safe and has been used for studying how the brain works in hospitals and universities all over the world for many decades. The nets are



Example of an EEG "net"

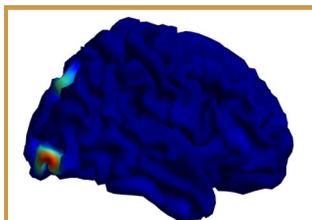
can show you your very own brain waves as they are happening!

Although the sensor net may look funny, there is no risk associated with measuring brain activity.

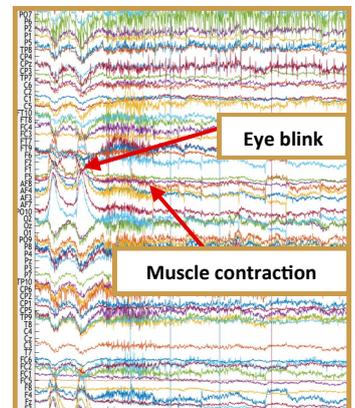
Hugo

specifically designed to be comfortable for babies and children, and as you can see in the picture, they look pretty cool!

When you wear this net, we can record your brain activity in real-time, so we



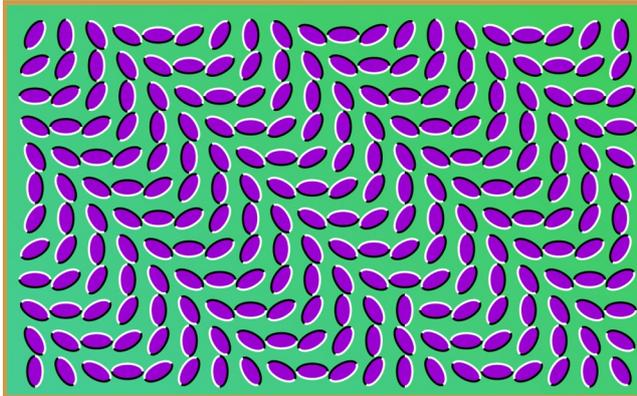
Brain "map" showing activations in the visual cortex (back of the head)



Example of an EEG recording
The EEG signal can easily be deformed by eye blinks or muscle contractions.

Game Section

OPTICAL ILLUSIONS



Floating Rice

Move your eyes around.

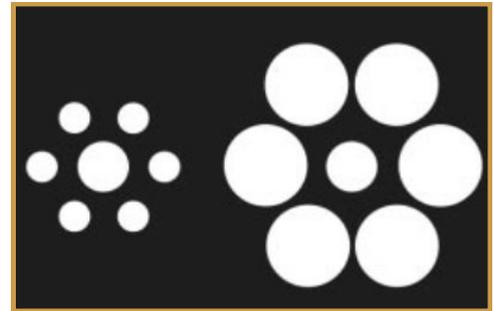
What if we tell you that there is no motion in this picture? Would you believe us?

The Two Flowers

Look closely at the two clusters of circles.

Now look at the two middle circles. Which one is bigger?

Measure across the middle (diameter) of each circle. What did you discover?



Colour in the Brain!

